

Listing of Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 1-52 (canceled)

Claim 53 (new): An electrotherapy apparatus comprising a sensor for detecting periodically recurring signal peaks, in particular the R-R peaks of an electrocardiogram of a person, a processor for deriving from the time interval between said periodically recurring signal peaks a time delay corresponding to approximately the end of the T-wave, a trigger system initiated by an output signal of said processor or embodied within said processor for applying a train of electrical stimulation pulses to one or more active electrodes provided on the said person at a time related to the end of said time delay,

wherein the processor is adapted to generate, for each R-R period of a heart rate, a first train of electrical stimulation pulses having a first pulse repetition frequency and a first interval between successive pulses to induce an initial muscle contraction, and a plurality of further electrical stimulation pulses or groups of electrical stimulation pulses, said further electrical stimulation pulses or groups of electrical stimulation pulses being generated at intervals longer than said first interval between the pulses of the first train of electrical stimulation pulses, so that said further electrical stimulation pulses or groups of electrical stimulation pulses maintain said muscle contraction with a reduced energy input, said apparatus being adapted to apply said further electrical stimulation pulses or groups of electrical stimulation pulses to said person over a period extending from said first train of electrical stimulation pulses up to a time just before a next expected R-peak.

Claim 54 (new): An electrotherapy apparatus in accordance with claim 53, wherein the processor is adapted to make a determination for successive pairs of signal peaks received from said sensor of a value corresponding to the time interval between said successive pairs of signal peaks and thus to the said person's momentary heart rate.

Claim 55 (new): An electrotherapy apparatus in accordance with claim 53, wherein said processor is adapted to generate said first train of electrical stimulation pulses at a time in the range from -5 % of the preceding R-R path length, or of an average value of the preceding R-R path lengths, before the expected end of the T-wave and 45 % of the preceding R-R path length, or of an average value of the preceding R-R path lengths, after the expected end of the T-wave.

Claim 56 (new): An electrotherapy apparatus in accordance with claim 53, wherein the first train of electrical stimulation pulses comprises a plurality of biphasic signal pulses.

Claim 57 (new): An electrotherapy apparatus in accordance with claim 56, wherein the first train of electrical stimulation pulses comprises from 2 to 10 individual pulses having a first pulse repetition frequency in the range from 50 to 250 Hz, preferably in the range from 100 to 200 Hz and especially of 150 Hz.

Claim 58 (new): An electrotherapy apparatus in accordance with claim 56, wherein said further pulses have a pulse repetition frequency in the range from 20 to 80 Hz, preferably in the range from 30 to 50 Hz, and especially of 40 Hz.

Claim 59 (new): An electrotherapy apparatus in accordance with claim 53, wherein the pulses of said first train of electrical stimulation pulses have a pulse width lower than a pulse interval between said pulses.

Claim 60 (new): An electrotherapy apparatus in accordance with claim 59, wherein said pulses of said first train of electrical stimulation pulses have a pulse width of the order of magnitude of 1 ms and the pulse intervals between the said pulses have a duration of the order of magnitude of 3 to 10 ms.

Claim 61 (new): An electrotherapy apparatus in accordance with claim 53, wherein said further stimulating pulses are single biphasic pulses.

Claim 62 (new): An electrotherapy apparatus in accordance with claim 53, wherein the pulse interval between said further electrical stimulation pulses lies in the range from 15 to 45 ms.

Claim 63 (new): An electrotherapy apparatus in accordance with claim 53, wherein the interval between said further electrical stimulation pulses is selected to be greater than an interval between a signal being initiated at said sensor by a new R-peak and a time delay until this signal has been processed by said processor.

Claim 64 (new): An electrotherapy apparatus in accordance with claim 53, wherein said processor is adapted to terminate said further electrical stimulation pulses at a time such that said muscle contraction finishes in a calculated window of 85% to 95% of the preceding R-R path length, or of an average value of the preceding R-R path length, after the last R-peak.

Claim 65 (new): An electrotherapy apparatus in accordance with claim 64, wherein the processor is adapted to terminate said further electrical stimulation pulses at a time in the range from 70 to 90 % of the preceding R-R path length, or of an average value of the preceding R-R path length, after the last detected R-peak.

Claim 66 (new): An electrotherapy apparatus in accordance with claim 53, wherein on detection of a next R-peak earlier than the expected time corresponding to the preceding R-R path length since the last R-pulse, or corresponding to an average value of the preceding R-R path lengths since the last R-pulse, the processor is adapted to inhibit any further electrical stimulation pulse until a time after the projected end of the T-wave in a subsequent heart cycle.

Claim 67 (new): An electrotherapy apparatus in accordance with claim 53, wherein the processor is adapted to vary the pulse repetition frequency of the first train of electrical stimulation pulses in accordance with a predetermined pattern or randomly within a specified frequency range.

Claim 68 (new): An electrotherapy apparatus in accordance with claim 53, wherein the processor is adapted to vary the pulse repetition frequency of the further electrical stimulation pulses in accordance with a predetermined pattern or randomly within a specified frequency range.

Claim 69 (new): An electrotherapy apparatus in accordance with claim 53, wherein said processor is adapted to vary an amplitude of pulses comprising said first train of electrical stimulation pulses and/or of said further electrical stimulation pulses in accordance with a predefined pattern or randomly within a pre-specified range.

Claim 70 (new): An electrotherapy apparatus in accordance with claim 53, wherein the processor is adapted to vary the shape of pulses comprising said first train of electrical stimulation pulses and of said further pulses.

Claim 71 (new): An electrotherapy apparatus in accordance with claim 53, wherein said sensor comprises an electrocardiograph and said processor is provided with a gating program to inhibit recognition of supposed R-peaks from said electrocardiograph in time intervals corresponding to the transmission of said first train of electrical stimulation pulses and of said further electrical stimulation pulses.

Claim 72 (new): An electrotherapy apparatus in accordance with claim 53, wherein said sensor is a non-electric sensor, or a non-electric sensor used in addition to an electrocardiograph.

Claim 73 (new): An electrotherapy apparatus in accordance with claim 72, wherein said non-electric sensor is selected from the group comprising a non-invasive, aortic pressure measurement device, an invasive aortic pressure measurement device and a noise detection device adapted to detect the closing of the heart valves.

Claim 74 (new): An electrotherapy apparatus in accordance with claim 53, wherein the apparatus has a plurality of output channels for applying electrical stimulations to a plurality of active electrodes provided on the said person.

Claim 75 (new): An electrotherapy apparatus in accordance with claim 74, wherein a plurality (Y) of channel groups (A, B; A, B, C) is provided, each channel group (A, B; A, B, C) comprising a plurality of channels.

Claim 76 (new): An electrotherapy apparatus in accordance with claim 75, wherein each channel group (A, B; A, B, C) has the same number of channels (Ch.1, Ch. 2, Ch. 3, Ch.4 (Group A); Ch. 5, Ch. 6, Ch. 7, Ch. 8 (Group B); Ch. 9, Ch. 10, Ch. 11, Ch. 12 (Group C)).

Claim 77 (new): An electrotherapy apparatus in accordance with claim 76, wherein means are provided for providing each channel group (A, B; A, B, C) with the same time delay.

Claim 78 (new): An electrotherapy apparatus in accordance with claim 76, wherein means are provided for providing each channel group (A, B; A, B, C) with a respective time delay generally different from time delays associated with other channel groups.

Claim 79 (new): An electrotherapy apparatus in accordance with claim 78, wherein the processor is adapted to provide a said time delay for one group of channels (A) and to add a respective time offset to said time delay for each further channel group (B; B, C).

Claim 80 (new): An electrotherapy apparatus in accordance with claim 53, wherein said further electrical stimulation pulses each comprise a train of pulses, the pulses of each train being separated by an interval or following one another directly, thereby defining a duration of each train.

Claim 81 (new): An electrotherapy apparatus in accordance with claim 80, wherein intervals are present between the initial electrical stimulation and the first train and between sequential trains.

Claim 82 (new): An electrotherapy apparatus in accordance with claim 80, wherein the pulses in any train can have amplitudes of any desired level and different amplitudes within the same train and/or the duration of each train can be different from the duration of any other train and/or the pulse repetition frequency of the pulses in any one train can be different and can differ from train to train.

Claim 83 (new): A method of treating a person or a mammal, using an electrotherapy apparatus, the method comprising the steps of:

- determining from the signal peaks of an electrocardiogram for at least a majority of the detected heart cycles a time corresponding to the distance between successive pairs of R-R peaks,
- generating an initial electrical stimulation signal,
- applying said initial electrical stimulation signal to a muscle or group of muscles of said person or mammal at a time related to the predicted end of the T-wave and lying in the range from -5 % of the R-R path length of the preceding heart cycle, or of an average preceding R-R path length, before the predicted end of the T-wave, up to +45 % of the preceding R-R path length of the preceding heart cycle, or of an average preceding R-R path length, after the end of the T-wave to generate a muscle contraction, and
- applying further electrical stimulation pulses to said muscle or group of muscles to maintain said contraction for a time after the last detected R-peak corresponding to 85 to 95 % of the R-R path length of the preceding heart cycle or of an average preceding R-R path length.

Claim 84 (new): A method in accordance with claim 83, wherein the step of applying further electrical stimulation pulses to said muscle or group of muscles to maintain said contraction comprises applying further stimulating pulses to said muscle or group of muscles at intervals longer than an interval between pulses of the initial electrical stimulation, i.e. at a

second pulse repetition frequency lower than a first pulse repetition frequency of the initial electrical stimulation.

Claim 85 (new): A method in accordance with claim 84, wherein the initial electrical stimulation pulse comprises from 2 to 10 individual pulses having a first pulse repetition frequency in the range from 50 to 250 Hz, preferably in the range from 100 to 200 Hz and especially of 150 Hz.

Claim 86 (new): A method in accordance with claim 84, wherein said second pulse repetition frequency for said further pulses lies in the range from 20 to 80 Hz, preferably in the range from 30 to 50 Hz, and especially of 40 Hz.

Claim 87 (new): A method in accordance with claim 83, wherein the pulses of said initial electrical stimulation have a pulse width lower than a pulse interval between said pulses.

Claim 88 (new): A method in accordance with claim 87, wherein said pulses of said initial electrical stimulation have a pulse width of the order of magnitude of 1 ms and the intervals between the said pulses have a duration of the order of magnitude of 3 to 10 ms, preferably 5 to 6 ms.

Claim 89 (new): A method in accordance with claim 83, wherein said further stimulating pulses are single biphasic pulses.

Claim 90 (new): A method in accordance with claim 83, wherein the pulse interval between said further electrical stimulation pulses lies in the range from 15 to 45 ms and is preferably 20 to 30 ms and especially ca. 25 ms.

Claim 91 (new): A method in accordance with claim 83, wherein the interval between said further electrical stimulation pulses is selected to be greater than a time delay

associated with a signal being initiated at said sensor by an R-peak and the time delay until this signal has been processed by said processor.

Claim 92 (new): A method in accordance with claim 83, wherein said processor terminates said further electrical stimulation pulses at a time such that said muscle contraction finishes in a calculated window of 85% to 95% of the preceding R-R path lengths, or of an average value of the preceding R-R path lengths, after the last R-peak.

Claim 93 (new): A method in accordance with claim 83, wherein the processor is adapted to terminate said further electrical stimulation pulses at a time in the range from 70 to 90 % of the preceding R-R path length, or of an average value of the preceding R-R path lengths, after the last detected R-peak.

Claim 94 (new): A method in accordance with claim 83, wherein on detection of a next R-peak earlier than the expected time corresponding to the preceding R-R path length since the last R-pulse, or corresponding to an average value of the preceding R-R path lengths since the last R-pulse, the processor is adapted to inhibit any further electrical stimulation pulse until a time after the projected end of the T-wave in a subsequent heart cycle.

Claim 95 (new): A method in accordance with claim 83, wherein the pulse repetition frequency of the initial electrical stimulation can be varied by said processor in accordance with a predetermined pattern or randomly within a specified frequency range.

Claim 96 (new): A method in accordance with claim 83, wherein the pulse repetition frequency of the further electrical stimulation pulses is varied by said processor in accordance with a predetermined pattern or randomly within a specified frequency range.

Claim 97 (new): A method in accordance with claim 83, wherein said processor varies an amplitude of pulses comprising said initial electrical stimulation and/or of said further pulses in accordance with a predefined pattern or randomly within a pre-specified range.

Claim 98 (new): A method in accordance with claim 83, wherein the processor varies the shape of pulses comprising said initial electrical stimulation and of said further pulses.

Claim 99 (new): A method in accordance with claim 83, wherein the electrotherapy apparatus has a plurality of output channels for applying electrical stimulations to a plurality of active electrodes provided on the said person and in that, in a first heart cycle, a first output channel delivers electrical stimulation signals to a first electrode, and, in a second heart cycle, a second output channel delivers electrical stimulation signals to a second active electrode and so on until a last output channel delivers electrical stimulation signals to a last active electrode, whereupon the cycle repeats with the first output channel delivering electrical stimulation signals to said first active electrode etc.

Claim 100 (new): A method of treating a person or a mammal in accordance with claim 83, wherein a plurality (Y) of channel groups (A, B; A, B, C) is provided, each channel group (A, B; A, B, C) comprising a plurality of channels, wherein each channel group of output channels is associated with a respective group of muscles in general proximity to one another on a body of said person or mammal, wherein the group of muscles associated with one group of output channels differs from a group of muscles associated with any other group of output channels, and wherein the stimulation signals transmitted from each group of output channels to the respectively associated group of muscles are triggered at the same time for each group of channels.

Claim 101 (new): A method of treating a person or a mammal using electrotherapy apparatus in accordance with claim 83, wherein a plurality (Y) of channel groups (A, B; A, B, C) is provided, each channel group (A, B; A, B, C) comprising a plurality of channels, wherein each channel group of output channels is associated with a respective group of muscles in general proximity to one another on a body of said person or mammal, wherein a group of muscles associated with one group of output channels differs from a group of muscles associated with any other group of output channels, and wherein the stimulation signals

transmitted from each group of output channels to the respectively associated group of muscles are triggered at different times for each group of channels.

Claim 102 (new): A method in accordance with claim 101, wherein the groups of muscles respectively associated with each group of channels are disposed on a body of said person or mammal such that a group of muscles closer to the heart and associated with one group of channels is stimulated later than a group of muscles disposed further from the heart and associated with another group of channels.

Claim 103 (new): A method in accordance with claim 101, wherein the groups of muscles respectively associated with each group of channels are disposed on a body of said person or mammal such that a group of muscles further from the heart and associated with one group of channels is stimulated later than a group of muscles disposed closer to the heart and associated with another group of channels.